

THE UNITED STATES PATENT AND TRADEMARK OFFICE

Appl. No. : 09/837,503 Confirmation No. 8044
Applicant : Vincent M. Callaghan et. al.
Filed : April 18, 2001
TC/A.U. : 1764
Examiner : Jennifer A. Leung
Docket No. : 01-104
Customer No. : 34704

Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313

Appeal Brief

Dear Sir:

This brief is submitted in support of a Notice of Appeal
which was filed on October 9, 2008.

i) Real Party in Interest - The real party in interest in this appeal is the assignee and owner of the application, namely, UTC Fuel Cells, L.L.C. (now known as UTC Power Corporation).

ii) Related appeals and interferences - There are no known related appeals or interferences.

iii) Status of claims - The application currently contains claims 2, 5-11, 17 and 18, all of which are rejected and on appeal. Claims 1, 3-4 and 12-16 have been cancelled.

iv) Status of amendments - There have been no amendments filed after the final rejection from which appeal is taken. The claims are as listed in the claims appendix.

v) Summary of the claimed subject matter. The application contains independent claims 6 and 18.

Independent claim 6 calls for a fuel cell system 10 (reference numerals in Figure 1, and specification page 4, lines 14-15), comprising:

a fuel processor 12 for converting a hydrocarbon fuel into a high temperature reformed gas containing hydrogen, carbon dioxide and carbon monoxide (specification page 4, lines 14-15),

first conduit means 18 for communicating the reformed gas to a shift converter 20 located downstream of the fuel processor 12 for further converting the reformed gas to primarily a hydrogen and carbon dioxide containing gas stream (Specification page 4, lines 19-25),

second conduit means 22 for communicating the gas stream to a fuel cell 30 downstream of the shift converter 20 for reacting the hydrogen in the gas stream (Specification page 4, lines 24-29),

a source of liquid phase water 28 (Specification page 5, lines 10-14), and

water feed means (Specification page 5, lines 14-28) for feeding liquid phase water from the source 28 to the first and second conduit means 18, 22 in a controlled manner for cooling the reformed gas and gas stream, respectively, to a desired temperature, wherein the water added to the reformed gas sets the desired oxygen/carbon ratio for the shift converter 20, and further including at least one selective oxidizer 24 or 26, between the shift converter 20 and the fuel cell 30, and located downstream of where the water feed means feeds water to the second conduit means 22 (Specification page 4, lines 26-29).

This claim calls for first and second conduit means and water feed means. Treatment of the first and second conduit means is not influenced by treatment under 35 USC 112, sixth

paragraph, because in either event the claimed structure is a conduit for carrying the reaction products between the components called out in the claim. Thus, applicant does not specifically call for treatment of the conduit means in this claim under 35 USC 112, sixth paragraph, but it is submitted that the end result is the same, the structure called out is a conduit.

Turning to the water feed means, this claim element does trigger 35 USC 112, sixth paragraph. The function called out is "for feeding liquid phase water from the source 28 to the first and second conduit means 18, 22 in a controlled manner for cooling the reformed gas and gas stream, respectively, to a desired temperature". The water feed means function is carried out by the water line 42, injection points 32, 34, valves 46 and sensors 44. In this regard note that only one of the valves 46 and sensors 44 are actually numbered in Figure 1, but obviously these components are illustrated in the vicinity of injection points 34, 36 and 38 as well as injection point 32. The operation of these components is called out in the specification on page 5, starting at line 8 and continuing through line 30.

Claim 18 calls for A fuel cell system10 (reference numerals in Figure 1, and specification page 4, lines 14-15), comprising:

a fuel processor 12 for converting a hydrocarbon fuel into a high temperature reformed gas containing hydrogen, carbon dioxide and carbon monoxide (specification page 4, lines 14-15);

a shift converter 20 located downstream of the fuel processor for further converting the reformed gas to primarily a hydrogen and carbon dioxide containing gas stream (Specification page 4, lines 19-25),

a fuel cell 30 downstream of the shift converter for reacting the hydrogen in the gas stream (Specification page 4, lines 24-29),

a first conduit 18 connecting the fuel processor 12 to the shift converter 20 for carrying the reformed gas to the shift converter 20 (Specification page 4, lines 19-25);

a second conduit 22 connecting the shift converter 20 with the fuel cell 30 for carrying the gas stream to the fuel cell 30 (Specification page 4, lines 24-29);

a source of liquid phase water 28 (Specification page 5, lines 10-14); and

a water feed control unit (Specification page 5, lines 14-28) for feeding liquid phase water in a controlled manner from the source to at least one of the first and second conduits 18, 22 for cooling at least one of the reformed gas and gas stream, respectively, to a desired temperature, wherein the water feed control unit includes a sensor 44 for sensing temperature of the at least one of the reformed gas and gas stream, a valve 46 for adjusting the flow rate of water into the at least one of the reformed gas and the gas stream, and a control unit for controlling the valve based upon temperature sensed by the sensor, and whereby evaporation of the liquid phase water cools the at least one of the reformed gas and the gas stream (function of these components is described in the above noted lines 14-28 of page 5 of the specification).

Dependent claim 8 calls for means for atomizing the water, and these means are the chamber 48, packing 50 within the chamber 48, and nozzle 52 for injecting water to the chamber as illustrated in Figure 2. These components and their function are described in the specification on page 5, line 31 through page 6, line 14.

vi) Grounds of rejection to be reviewed on appeal

Ground 1 - Whether claim 6 is obvious over US 6,458,478 to Wang et al. (Hereafter Wang) in view of US 4,046,956 to Fanciullo (Hereafter Fanciullo).

Ground 2 - Whether claims 18, 2, 5, 7 and 11 are obvious over JP 62-283567 to Takeo (Hereafter Takeo) in view of JP 59-213940 to Hirota (Hereafter Hirota), Applicant's Disclosed Prior Art (hereafter ADPA) and US 4,264,566 to Giles (Hereafter Giles).

Ground 3 - Whether claims 6 and 17 are obvious over Takeu in view of Hirota, ADPA, Giles and Fanciullo.

Ground 4 - Whether claims 8-10 are obvious over Takeu in view of Hirota, ADPA, Giles and US 5,380,088 to Fleischli et al. (Hereafter Fleischli).

vii) Argument

Remarks/Arguments

Ground 1

Starting with claim 6, this claim calls for, among other things, the positioning of a selective oxidizer between the shift converter and the fuel cell, and downstream of where the water feed means feeds water to the second conduit means.

The Examiner has rejected this claim as obvious based upon Wang in view of Fanciullo. In making this rejection, the Examiner conceded that Wang et al. is silent as to at least one selective oxidizer between the shift converter and the fuel cell, and located downstream of where the water feed means feeds water to the second conduit means.

The Examiner contends that this lacking in Wang et al. is made up by Fanciullo, and indicates that Fanciullo teaches a selective oxidizer between the shift converter and the fuel cell. The Examiner then reasons that it would be obvious to modify Wang according to the teachings of Fanciullo to incorporate a selective oxidizer between the shift converter and the fuel cell. The Examiner further reasons that one having skill in the art would know to put the selective oxidizer of Fanciullo downstream of both of the shift convertors of Wang. It is not clear what teaching support this conclusion, and this the positioning of Fanciullo's selective oxidizer downstream of a shift convertor, when there are two shift convertors as in Wang, seems to not be a clear teaching of either position. Further, these ambiguous locations resulting from efforts to combine the teachings of Fanciullo and Wang result in various locations, at least some of which do not correspond to the instant claims. It is submitted that it would not at all be obvious to place the selective oxidizer where located according to the present application, and further that the location in the

present application serves the stated purpose of the invention as recited in the specification, while no such purpose or motive for such placement is stated in either Wang et al. or Fanciullo. The present specification teaches that this placement of the selective oxidizer is so that any remaining carbon monoxide in the gas stream can be further reduced prior to feeding the gas stream to the fuel cell. If not fed downstream of the water injection point, then reduction would not be as likely to occur as is taught and desired in accord with the present invention. Since this location is for a specific purpose, and it is not at all taught or suggested by any of the art of record, it is submitted that claim 6 is allowable over the art of record, reversal of this rejection is earnestly solicited.

Ground 2

Turning to claim 18, this claim calls for the water injection means to inject liquid phase water. The Examiner concedes that Takeu (the primary reference used to reject claim 18) does not at all disclose this subject matter. Instead, Takeu discloses a very different injection of steam, or vapor phase water. This is critically different in that the water is much more effective to cool when it is introduced in liquid phase. It is submitted that this claim limitation is in fact properly given weight in the present claim, and further that there are surprising results in using liquid phase water. The teaching of liquid phase water in other prior art patents which have been used as secondary prior art should not be seen as evidence that a person of skill in the art would make such a modification. The Examiner paraphrases the reasons from the present specification as to why liquid phase water is desired and then relies upon these reasons to conclude that this subject matter is obvious based upon the teachings of Takeu. Reversal

of this rejection for this reason is believed proper and earnestly solicited.

Still dealing with this ground of rejection, the control feature also supports patentability. With Takeo being silent, the Examiner turns to Applicant's "Disclosed Prior Art", which teaches that such control systems themselves are known in the art. The use of such control systems in the present invention is not at all disclosed or suggested by ADPA or any other art of record, and claim 18 should be allowed. All that is stated in the portion of the specification cited by the Examiner is that the actual components for this type of control are known to persons skilled in the art. Clearly, there is no teaching at all from any art of record to incorporate such components into the system of the present invention. Reversal for this reason as well as respectfully solicited.

Ground 3

The Examiner has also rejected claim 6 as obvious over a combination of prior art based upon Takeu. The same reasoning supporting reversal of the rejection of claim 6 in Ground 1 applies here. The combination of art does not at all suggest the placement of the selective oxidizer relative to the water injection point. Reversal of this rejection is earnestly solicited.

Ground 4

Claims 8-10 depend from claim 18 and are believed allowable based upon the arguments set forth in Ground 2. In addition, claim 8 calls for means for atomizing, and the Examiner has added Fleischli as teaching this subject matter. While Fleischli may teach a structure which atomizes a stream of liquid, it is submitted that nothing in the art of record would

lead a person of skill in the art to combine this structure into the water feed zone of the present claims, and therefore that this rejection is not proper under 35 USC 103 and should be reversed.

Please charge the fee of \$540 for filing an appeal brief to deposit account 02-0184. It is believed that no other fee is due in connection with this paper. If, however, any such fee is due, please charge same to Deposit Account No. 02-0184.

Respectfully submitted,

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Claims Appendix

1. (Cancelled)
2. (Previously presented) A fuel cell system according to claim 18, wherein the control unit is programmed to control the valve to add water to the reformed gas to obtain a desired oxygen/carbon ratio for the shift converter.
3. (Cancelled)
4. (Cancelled)
5. (Previously presented) A fuel cell system according to claim 18, further including means for collecting liquid phase water from the fuel cell and recycling at least a portion of the collected liquid phase water to the source.
6. (Previously presented) A fuel cell system, comprising:
 - a fuel processor for converting a hydrocarbon fuel into a high temperature reformed gas containing hydrogen, carbon dioxide and carbon monoxide,
 - first conduit means for communicating the reformed gas to a shift converter located downstream of the fuel processor for further converting the reformed gas to primarily a hydrogen and carbon dioxide containing gas stream,
 - second conduit means for communicating the gas stream to a fuel cell downstream of the shift converter for reacting the hydrogen in the gas stream,
 - a source of liquid phase water, and
 - water feed means for feeding liquid phase water from the source to the first and second conduit means in a controlled manner for cooling the reformed gas and gas stream, respectively, to a desired temperature, wherein the water added to the reformed gas sets the desired oxygen/carbon ratio for the shift converter, and further including at least one selective oxidizer, between the shift converter and the fuel cell, and

located downstream of where the water feed means feeds water to the second conduit means.

7. (Previously presented) A fuel cell system according to claim 18, wherein the valve comprises at least one solenoid valve which opens and closes in response to the sensed temperature.

8. (Previously presented) A fuel cell system according to claim 18, wherein the water feed control unit includes means to atomize the water.

9. (Previously presented) A fuel cell system according to claim 8, wherein at least one of the first conduit and the second conduit includes a packing of high surface area material and the wherein the water feed control unit feeds water to the material.

10. (Original) A fuel cell system according to claim 9, wherein said high surface area material is selected from the group consisting of ceramic pellets, steel wool, reticulated ceramic foam, metal foam, and honeycomb monoliths.

11. (Previously presented) A fuel cell system according to claim 2, wherein the water feed control unit is adapted to feed water to both the first conduit and the second conduit.

12-16. (cancelled).

17. (Previously presented) A fuel cell system according to claim 18, further comprising at least one selective oxidizer positioned between the shift converter and the fuel cell, and located downstream of where the water feed control unit feeds water to the second conduit.

18. (Previously presented) A fuel cell system, comprising:
a fuel processor for converting a hydrocarbon fuel into a high temperature reformed gas containing hydrogen, carbon dioxide and carbon monoxide;

a shift converter located downstream of the fuel processor for further converting the reformed gas to primarily a hydrogen and carbon dioxide containing gas stream,

a fuel cell downstream of the shift converter for reacting the hydrogen in the gas stream,

a first conduit connecting the fuel processor to the shift converter for carrying the reformed gas to the shift converter;

a second conduit connecting the shift converter with the fuel cell for carrying the gas stream to the fuel cell;

a source of liquid phase water; and

a water feed control unit for feeding liquid phase water in a controlled manner from the source to at least one of the first and second conduits for cooling at least one of the reformed gas and gas stream, respectively, to a desired temperature, wherein the water feed control unit includes a sensor for sensing temperature of the at least one of the reformed gas and gas stream, a valve for adjusting the flow rate of water into the at least one of the reformed gas and the gas stream, and a control unit for controlling the valve based upon temperature sensed by the sensor, and whereby evaporation of the liquid phase water cools the at least one of the reformed gas and the gas stream.

ix) Evidence appendix - None

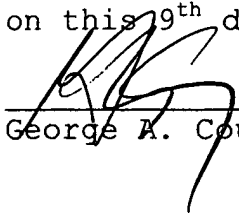
x) Related proceedings appendix - None

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